

Figure 3.1-6 shows primary roads and rail lines on and around WSMR.

For information on air transportation at WSMR, refer to Section 3.1.2.3.

3.1.2.12 Population and Employment

The six county region of influence (ROI) can be characterized as generally rural, with approximately 74 percent of the 1990 census population (815,900) concentrated in the three largest communities: El Paso, Texas (515,300); Las Cruces, New Mexico (62,100); and Alamogordo, New Mexico (27,600). The ROI 1990 census population represented a 24.9 percent increase for the decade.

Total employment over the decade (1981 to 1990) for New Mexico and Texas has grown 25.7 and 20.4 percent, respectively. The six counties composing the ROI experienced a slightly larger increase, 26.4 percent for the decade.

The nonfarm component of employment increased at a rate approximately 2 percentage points greater than total employment over the decade for both New Mexico and Texas. Major non-farm employment sectors in the ROI are Government (33 percent), services (23 percent), and retail trade (17 percent). Farm employment, on the other hand, decreased 13.4 percent in New Mexico and 12.0 percent in Texas over the decade.

3.1.3 ER

This section discusses the affected environment related to takeoff and landing sites on the ER described in Section 2.3.3.3.

3.1.3.1 Facilities and Infrastructure

Approximately 30 percent of CCAS (about 19 sq km (7 sq mi)) is developed and consists of operational, support, and industrial facilities, the majority of which are concentrated either in the Industrial Area or along Launch Row, north/south of the Skid Strip. CCAS contains 36 launch complexes (7 are currently active), a turning basin for docking of submarines, an airstrip initially constructed for R&D in recovery operations for missile launches, and a small industrial area. Many hangars located on the station are used for missile assembly and testing. (CCAS 1994-A)

KSC occupies almost 560 sq km (about 216 sq mi), sharing a common boundary with the Merritt Island National Wildlife Refuge (MINWR). Approximately 5 percent of the land is developed. In addition to launch operations, KSC is home to a number of world class scientific and research facilities. These facilities include: the Launch Equipment Test Facility (LETF), Operations and Checkout (O&C) Building, Developmental Test Laboratory, Advanced Systems Development Laboratory, and Materials Science Laboratory. (SFA 1995)

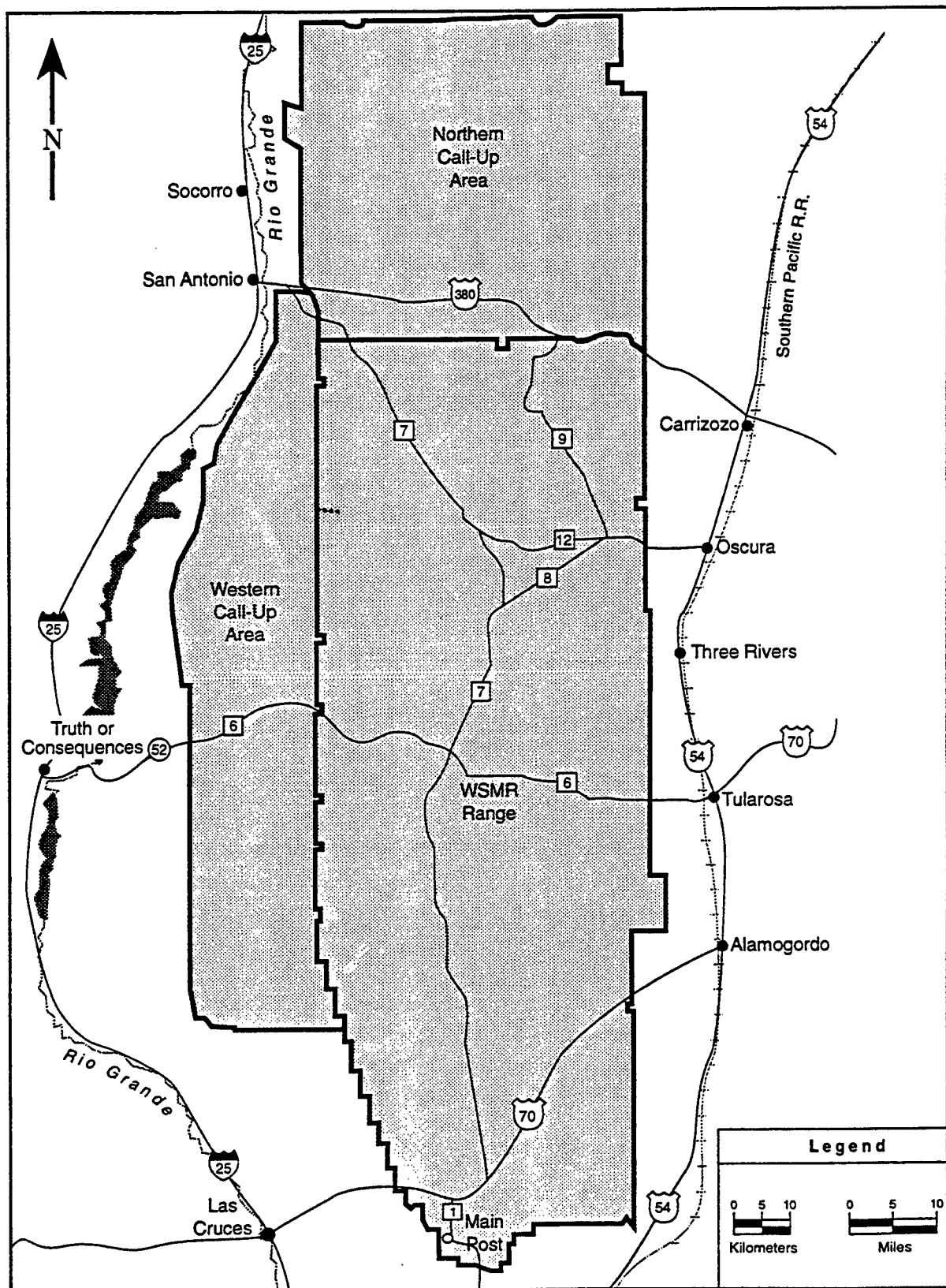


Figure 3.1-6. WSMR Transportation Map

Wastewater Treatment

CCAS treats both domestic and industrial wastewater on-site with 15 active WWTP's ranging in permitted capacity from 15,140 Lpd to 1.9 mLd (4,000 gpd to 0.5 mgd) and 109 septic tanks, each supporting isolated facilities and normally servicing less than 20 people. Maximum total flow from the 15 active WWTP's is 2.3 mLd (0.6 mgd). Design capacity of the main WWTP is 2.4 mLd (0.6 mgd) and permit capacity is 1.9 mLd (0.5 mgd). Process type is trickling filter, required treatment is secondary with basic disinfection, and effluent disposal is by percolation pond. Recorded data for average daily flow of wastewater in each WWTP indicates that flow is within permit capacity. The 30-year-old collection system includes approximately 35.4 km (22 mi) of sewer mains, 29 lift stations, and numerous manholes. The collection system, with upgrades for older lift stations, is adequate for another 20 years. A new consolidated wastewater treatment plant for CCAS is currently under construction and is scheduled to be completed in December 1996. The new WWTP will replace the old main WWTP and all package plants. Design capacity will be 3.1 mLd (0.8 mgd), providing a residual wastewater capacity of 0.8 mLd (0.2 mgd). The project includes collection lines, force mains, lift stations, and percolation ponds. It will have the capacity to handle deluge water, but the current plan is to continue discharging to grade after sampling and treating, if necessary.

KSC maintains operating permits for six wastewater treatment facilities. Two treatment plants, STP-1 and STP-4, located in the Industrial Area and VAB Area, respectively, provide service for approximately 80 percent of NASA and contractor personnel at KSC. STP-1 has a design capacity of approximately 1.4 mLd (0.4 mgd) and is operating at approximately 31 percent capacity. STP-4 has a design capacity of 0.8 mLd (0.2 mgd) and is operating at approximately 50 percent capacity. STP-10 services Spaceport USA. It has a design capacity of 0.4 mLd (0.1 mgd) and is operating at approximately 38 percent capacity. STP-15 has been converted to a grease treatment plant. The remaining permitted treatment facilities are small package plants which service outlying facilities and operational areas. In addition to state permitted facilities, a number of septic tank systems throughout KSC support small offices or temporary facilities. (KSC 1994-B, JPL 1995, CCAS 1991, CCAS 1994-A)

Electricity

Power distribution systems for the ER have a total capacity of 137,000 kVA. Florida Power and Light (FPL) provides power through high voltage, nominal 115 kV or 138 kV transmission lines from its 800-megawatt, oil-burning power plant located in Port St. John. Transformers at three main CCAS substations convert transmission voltage to distribution voltage, nominally 13.2 kV. Two transformers have capacities of 20 megavolt-amperes and the other has 15 MVA. About 170 smaller substations convert distribution voltage to user voltages. Of the total 467 km (290 mi) of primary and secondary distribution lines at CCAS, 193 km (120 mi) are overhead and 274 km (170 mi) are underground. A power generation plant was built in 1953, but has not generated power for approximately 20 years. A standby power generation plant is under construction, which will supply 4.5 megawatts (MW) to the existing critical loop. KSC distributes 13.2 or 13.8 kV to individual substations or transformers at various facilities from one of two main substations. KSC

also has a 5.0 MW emergency power generation plant which provides power to critical loads in the KSC LC-39 area in case of commercial power loss. Expansion of this plant to 10 MW is planned. The expansion should occur in 1998. (USAF 1996, KSC 1992-A)

Communications

KSC communication systems provide: conventional telephone service; transmission of large volumes of test data to central collection or reduction stations; transmission of timing information from operations centers to data gathering instrumentation at widely scattered locations; transmission of weather and range safety data; and communications with satellites, Space Shuttles, and other hardware in space. CCAS, with its numerous communications control centers, is the "hub" for all communications activities on the ER. Systems include point-to-point, air-to-ground, ship-to-shore, intrastation, interstation, and world-wide communications in support of the 45 SW and indirectly to NASA. All communication lines are underground at KSC and CCAS. Several television broadcasting companies have constructed facilities supporting launch broadcasting: ABC, CBS, CNN, and NBC. Radio broadcasters and wire services have installed trailer offices at the KSC press site, including: AP, AFP, Reuters, UPI, VOA, and Westwood One. (KSC 1992-A, CCAS 1994-C, USAF 1996)

Natural Gas

Natural gas is used at KSC primarily for facility heating, but also for cafeteria equipment and vehicles. City Gas Company provides natural gas at 2,068 kPa (300 psi) from a 30.5 cm (12 in) steel line along NASA Causeway and Kennedy Parkway. Branches off the main pipeline vary in size, 5 to 20 cm (2 to 8 in), and construction is steel or plastic. Extension of the pipeline eastward along NASA Causeway to service CCAS is expected in the 1996-1997 timeframe. (KSC 1996-E)

Fuel

CCAS has 116 AST's and 21 UST's for petroleum storage. Forty-four (44) are regulated and range in volume from 2,100 to 106,000 L (550 to 28,000 gal). Ninety-three (93) are unregulated and range in volume from 189 to 61,000 L (50 to 16,000 gal). There are 80 existing nonpetroleum tanks ranging in volume from 757 to 379,000 L (200 to 100,000 gal). JP-5 jet fuel is stored at CCAS, and additional jet fuel is stored at PAFB. Capacities are unknown at this time. Five AST's ranging in capacity from 37,854 L to 107,884 L (10,000 gal to 28,500 gal) are used to store LOX (total storage capacity 395,576 L (104,500 gal)). Five AST's ranging in capacity from 92,743 L to 105,992 L (24,500 gal to 28,000 gal) are used to store LH₂ (total storage capacity 503,460 L (133,000 gal)).

At KSC, number 2 diesel fuel is delivered in bulk via tanker trucks from local vendors. Primary storage is four large AST's located in the KSC LC-39 area. Three of the tanks have a capacity of 117,350 L (31,000 gal) each; the remaining one has a capacity of 37,900 L (10,000 gal). Tanks are topped off approximately every 3 weeks. Fuel is dispensed directly to the Utility Annex and to mobile equipment via two refueling trucks. An AST at the Generator Shop stores 2,100 L (550

gal) of diesel fuel. A 30,300 L (8,000 gal) UST located at the Heavy Equipment Maintenance Facility is used for mobile equipment and refueling trucks. A 1,900 L (500 gal) storage tank at KARS Park 1 stores number 2 diesel fuel for landscape and facility maintenance equipment. The heat plant has been converted to natural gas, but two storage tanks provide diesel fuel as a backup to the natural gas. Storage capacities are 56,800 and 674,000 L (15,000 and 178,000 gal). Other UST diesel storage tank capacities include: 37,900 L (10,000 gal) at the emergency power station; 11,000 L (3,000 gal) at the propellants lab; 600 L (150 gal) at the weather tower; and 75,700 L (20,000 gal) at the motor pool.

Unleaded gasoline (used for transportation and lawn maintenance equipment) is stored in a 30,300 L (8,000 gal) UST at the Heavy Equipment Maintenance Facility in the KSC Industrial Area. A 1,900 L (500 gal) tank at KARS Park 1 stores unleaded gasoline for landscape and facility maintenance equipment. Other unleaded gasoline storage tanks include: 2,100 L (550 gal) AST at the Generator Shop; 75,700 L (20,000 gal) UST at the motor pool; and 45,400 L (12,000 gal) UST at the VAB. Diesel fuel and unleaded gasoline dedicated to motor vehicles are delivered to KSC via tanker truck, 32,000 L (8,500 gal) at a time.

A Compressed Natural Gas (CNG) fueling station in the Industrial Area is dedicated to motor vehicles. Three storage cylinders are on-site, with a capacity of approximately 900 L (240 gal). City Gas Company of Florida maintains the pipeline for the CNG.

A summary of KSC's total fuel storage capacity is provided in Table 3.1-2.

Table 3.1-2. KSC's Approximate Total Fuel Storage Capacity

Type Fuel	AST		UST		Tankers		Total Capacity (L)
	No. of Tanks	Subtotal Capacity (L)	No. of Tanks	Subtotal Capacity (L)	No. of Tankers	Subtotal Capacity (L)	
Diesel fuel	53	1,670,000	18	367,753	0	0	2,040,000
Regular gasoline	2	3,790	2	416	0	0	4,200
Unleaded gasoline	1	1,890	6	265,000	0	0	267,000
JP-5	5	379,000	0	0	5	92,400	471,000
Fuel Oil	3	8,710	0	0	0	0	8,710
LOX	8	7,160,000	0	0	10	151,000	7,310,000
LH ₂	6	6,970,000	0	0	4	197,000	7,160,000

Source: KSC 1996-C and KSC 1996-D

Hazardous Waste Management

CCAS operates waste management under the 45 SW OPlan 19-14, Petroleum Products and Hazardous Waste Management Plan. Five main entities are involved in hazardous waste management and disposal for CCAS: the generator of the waste, NASA's Joint Propellants

Contractor (JPC), Launch Base Support Contractor (LBSC) for CCAS, DOD's Defense Reutilization and Marketing Office, and 45 SW Environmental Planning Function at PAFB (45 CES/CEV). CCAS operates five hazardous waste storage facilities permitted for ignitable and toxic wastes, halogenated solvents, used batteries, and spent sodium lamps. Maximum storage capacity is 41,600 L (200 55-gal drums (11,000 gal)). The station operates at an average capacity of 50 percent, managing approximately 181,000 kg (400,000 lb) of various regulated substances annually. Three of the storage facilities are planned to be closed over the next 2 years. CCAS has a secondary containment capacity of 20,000 L (5,300 gal). A permitted Explosives Ordnance Disposal (EOD) facility also exists on-site for treating reactive hazardous waste. CCAS generated 186,700 kg (411,700 lb) of hazardous waste in 1992, of which over 27,350 kg (60,300 lb) was recoverable or marketable as excess. (CCAS 1994-A, CCAS 1996-B)

Control of hazardous waste at KSC is assigned to the Waste Management Authority (WMA). KSC has a Florida Department of Environmental Protection (FDEP) operating permit for storage, treatment and disposal of hazardous waste. Two facilities operate under this permit. The Hazardous Waste Storage Facility at KSC LC-39 has a maximum capacity of 225,700 L (59,600 gal), and the facility at the hypergol area has a maximum capacity of 208,000 L (55,000 gal). The facility at the hypergol area is scheduled to be closed by the end of 1996. At that time, the storage facility at KSC LC-39 will receive all hazardous waste generated at KSC. KSC operates at approximately 30 percent of design capacity. (KSC 1994)

Solid Waste

CCAS's landfill is permitted for construction/demolition debris and asbestos only. General solid refuse is collected by private contractor and disposed off-station at the Brevard County Landfill. Of the 74 ha (182 ac) at the CCAS landfill, 4.2 ha (10.4 ac) are in operation and 45.8 ha (113.2 ac) remain available for use. The remainder of the landfill is closed. CCAS generated 2,609,000 kg (2,900 tons) of solid waste and 695,800 kg (767 tons) of recyclable solid waste in 1992. (CCAS 1994-A, CCAS 1996-B)

Solid nonhazardous waste management at KSC is accomplished by landfill and recycling facilities. The new 16 ha (39 ac) Class III landfill is permitted to receive between 16,330 and 63,500 kg (18 and 70 tons) of waste per day. Average daily accumulation is 20,000 kg (22 tons) per day.

3.1.3.2 Air Quality

The ER is located within an attainment area with respect to NAAQS for criteria pollutants. CCAS has been issued four air emission permits by FDEP covering various sources (e.g., boilers generating over 1 million British thermal units (Btu's), paint booths, fuel handling systems, and fugitive volatile organic compounds (VOC's). KSC has five area-wide FDEP operating permits covering all emission points on the center.

Ambient air quality at the ER is influenced by NASA and DOD operations, land management practices, vehicle traffic, and emission sources outside the range. Air quality is also influenced by

emissions from two regional power plants located within a 16 km (10 mi) radius of the range. Space launches, training fires, and fuel load reduction burns influence air quality as episodic events.

Ambient air quality is monitored by Permanent Air Monitoring System (PAMS) stations. Continuous analyzers monitor SO₂, NO₂, CO, O₃, and PM₁₀. Instruments in meteorological towers monitor wind speed, wind direction, high and low temperature, and relative humidity.

NO₂ and SO₂ emissions are related to utilized fuel combustion and mobile sources. A strong correlation between elevated NO₂ and SO₂ levels and prevailing westerly winds indicate that power plants to the west of the ER are the primary source of these emissions.

O₃ is the most consistently elevated criteria pollutant at the ER. Local sources, as well as distant metropolitan areas, can contribute to elevated ozone levels. Ozone precursors generated over land are directed offshore by prevailing evening winds. Morning sunlight catalyzes the conversion to ozone and onshore breezes can return ozone to the land mass. Six exceedances of ambient air quality standards for O₃ have been recorded at KSC since 1988.

3.1.3.3 Airspace

The ER has a number of restricted and warning areas associated with space launch and Space Shuttle recovery operations (Figure 3.1-7). For Space Shuttle landing training, other specific areas are controlled to prevent interference from intruding aircraft. In addition, Notices to Airmen (NOTAM's) are issued as required for rocket stage impact areas and impacts predicted in remote areas—such as the Indian and Pacific Oceans—where appropriate authorities are notified. A summary of restricted and warning areas follows.

R-2932, R-2933, and R-2934 cover airspace immediately over CCAS and KSC. Airspace is controlled from the surface to unlimited altitude in steps from ground to 1,500 m (5,000 ft); 1,500 to 4,600 m (5,000 to 15,000 ft); and to unlimited altitude. Below 1,500 m (5,000 ft) in the area of the CCAS Skid Strip, the restricted area is continuously activated, and above 1,500 m (5,000 ft), it is activated by NOTAM 24 hours in advance. Aircraft transiting these areas must be in contact with PAFB Approach Control.

R-2931 is a circle 3,700 m (12,000 ft) in radius which lies under R-2934. It covers airspace from ground to 4,600 m (15,000 ft) and is activated by NOTAM 24 hours in advance.

R-2935 overlies CCAS and KSC as well as some of the surrounding areas. It begins at 3,350 m (11,000 ft) and goes to unlimited altitude. It is activated by NOTAM 24 hours in advance.

W-497A and W-497B begin where R-2932, R-2933, and R-2934 end just off the CCAS and KSC shorelines and continue out approximately 111,100 m (364,600 ft). They control altitude from surface to unlimited and are activated by NOTAM. When not activated, airspace is controlled by the Miami Center.

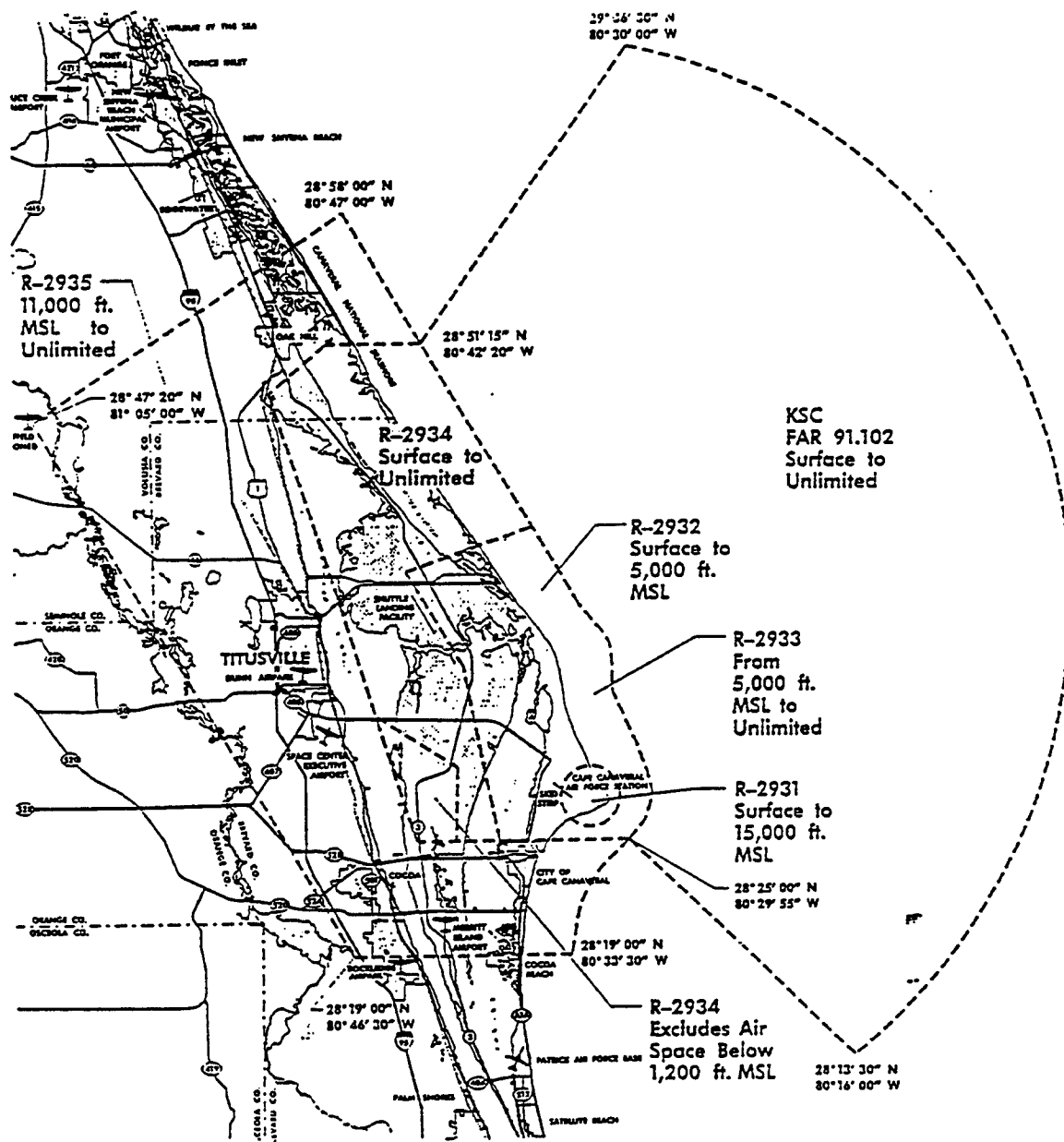


Figure 3.1-7. KSC and CCAS Restricted Airspace

FAR 91.143 airspace covers an area approximately 50,000 m (164,000 ft) offshore in an expanding arc from the edges of R-2932, R-2933, and R-2934 restricted areas. Altitude is surface to unlimited. It is activated by NOTAM 3 hours before Space Shuttle launch and 3.5 hours before Space Shuttle landing.

NASA-A, NASA-B, and NASA-C are airspace reserved for Space Shuttle landing training. NASA-A overlies CCAS and KSC, plus areas to approximately 9,260 m (30,400 ft) south of R-2932, R-2933, and R-2934 and covers surface to 13,700 m (45,000 ft). NASA-B covers an area similar to R-2935 from 4,600 to 13,700 m (15,000 to 45,000 ft). NASA-C covers an area offshore and directly east of NASA-A from surface to 13,700 m (45,000 ft). The three areas are activated as required to support NASA Space Shuttle landing training at the SLF.

The most common type of operation supported by ER requiring airspace activation are space launches originating from CCAS and KSC. R-2932, R-2933, and R-2934 restricted areas typically are activated a few hours before launch for a period covering the launch window plus a short period after the window closes. Air traffic not directly involved in supporting the launch is kept out of restricted areas. For Space Shuttle launches, R-2935 is also activated to enable emergency recovery of the Space Shuttle Orbiter should it become necessary.

Vehicles launched from CCAS and KSC leave restricted and warning areas and are monitored during flight, including taking action to destroy the vehicles should it become necessary. Once beyond the restricted areas, vehicles generally operate at altitudes which eliminate concerns over clearance from other air traffic; they are far above any other aircraft.

Safety concerns define primary restrictions on operations within restricted and warning areas, as well as the ER in general. The normal ER launch azimuth limits are 37 degrees to 114 degrees, although allowable flight plans are defined primarily by safety risk analyses. These safety analyses define the acceptability of a given mission profile, which may result in restrictions not only on azimuth, but also on the loft angle of the trajectory as well. The ER does not normally place restrictions on airspeeds or mach numbers.

See Section 3.1.3.11 for a description of area airports.

3.1.3.4 Biological Resources

Vegetation

CCAS encompasses approximately 6,900 ha (17,200 ac) of land, including approximately 21 km (13 mi) of shoreline along the Atlantic Ocean and 19.6 km (12.2 mi) along the Banana River. The majority of the complex consists of vegetation indigenous to Florida coastal scrub (2,800 ha (7,000 ac)), coastal strand (378 ha (933 ac)), and coastal dune (263 ha (650 ac)) plant communities. Wetlands at CCAS include approximately 486 ha (1200 ac) of freshwater wetlands, 125 ha (310 ac) of mangrove swamp, 76 ha (189 ac) of salt marsh, and 647 ha (1600 ac) brackish impoundments. Hammocks at CCAS are small in size, totaling less than 40 ha (100 ac). Aquatic

marine habitats include ponds/borrow pits (21 ha (52 ac)), canals (25 ha (63 ac)), brackish water (40 ha (100 ac)), and saltwater (647 ha (1,600 ac)). Launch and support facilities cover most of the remaining hectares. Coastal scrub is characterized by dense growths of scrub vegetation, such as myrtle oak (*Quercus myrtifolia*), live oak (*Q. virginiana*), saw palmetto (*Serenoa repens*), and Chapman oak (*Q. chapmanii*).

Upland vegetation communities that could be affected by the X-33 Program are coastal strand and coastal scrub, which are dominated by sea oats, saw palmetto, myrtle oak, and sand live oak (*Quercus geminata*).

Community types at KSC are listed in Table 3.1-3. Vegetation maps for SLC-37 and KSC LC-39 are provided in Figures 3.1-8 and 3.1-9.

Wetlands and Floodplains

Wetlands are found in the central part of Merritt Island where they occur mainly in interdunal swales within scrub or slash pine (*Pinus elliotii*) flatwoods communities or along drainageways. Wetlands also occur on the edges of Merritt Island between uplands and lagoonal systems, Banana River, Banana Creek, Indian River, and Mosquito Lagoon. Wetland vegetation includes: swamp, savanna, marsh, sand cordgrass-black rush, saltwort-glasswort (*Batis maritima*, *Salicornia virginica*), saltmarsh cordgrass (*Spartina alterniflora*), and mangrove communities. The areas are dominated by red maple (*Acer rubrum*), elm (*Ulmus americana*), Carolina willow (*Salix caroliniana*), beardgrass (*Andropogon* spp.), sand cordgrass (*Spartina bakeri*), southern (*Typha domingensis*) and common (*Typha latifolia*) cattail, cabbage palm, black rush (*Juncus roemerianus*), saltgrass (*Distichlis spicata*), sea oxeye (*Borrchia frutescens*), buttonwood (*Conocarpus erecta*), and black (*Avicennia germinans*), white (*Laguncularia racemosa*), and red (*Rhizophora mangle*) mangrove. Many wetlands within MINWR provide habitat for approximately 200,000 waterfowl, including great blue herons, egrets, wood storks (*Mycteria americana*), cormorants, and brown pelicans (*Pelecanus occidentalis caroliensis*).

The Federal Emergency Management Agency has established both 100 year and 500 year floodplains for KSC and CCAS. Neither the SLC-37 nor the LC-39 launch site is located in either of these floodplains.

Wildlife

Coastal scrub and coastal woodland provide excellent cover for wildlife species such as the white-tailed deer, armadillo, southeastern beach mouse (*Peromyscus polionotus niveiventris*), bobcat (*Lynx rufus*), feral hog, Florida mouse (*Peromyscus floridana*), raccoon, rabbit, gopher tortoise (*Gopherus polyphemus*), and numerous bird, lizard, and snake species. Coastal strand is composed of a thicket of dense woody shrubs and includes species of cabbage palm (*Sabal palmetto*), saw palmetto, and tough buckthorn (*Bumelia tenax*). Coastal dunes consist mainly of sea oats (*Uniola paniculata*), which has been listed as a State Species of Special Concern. (CCAS 1994-A, CCAS 1994-D)